

CLAIMS

What is claimed is:

1. A method of obtaining coarse synchronization in a frequency hopped/direct sequence spread spectrum (FH/DSS) time division multiple access (TDMA) data link network, the method comprising:
- tuning a first receiver to a first frequency out of a plurality of frequencies used in the data link network;
 - observing signal strength of signals received on the first frequency during a sample time period to obtain a sample energy pattern;
 - determining an expected energy pattern corresponding to a time uncertainty window, the expected energy pattern being based upon a known hopping pattern;
 - comparing the sample energy pattern to a first portion of the expected energy pattern, the first portion of the expected energy pattern corresponding to a first time period within the time uncertainty window; and
 - determining whether the first time period is a coarse synchronization candidate as a function of the comparison between the sample energy pattern and the first portion of the expected energy pattern.

2. The method of claim 1, wherein observing signal strength of signals received on the first frequency during the sample time period to obtain the sample energy pattern further comprises:

obtaining a received energy pattern by observing the signal strength of the signals received on the first frequency during the sample time period;
comparing the received energy pattern to a threshold;
and

obtaining the sample energy pattern by eliminating energy components from the received energy pattern which do not exceed the threshold.

3. The method of claim 1, wherein the first time period corresponds to a first plurality of time slots used in the data link network and which fall within the time uncertainty window, and wherein determining the expected energy pattern further comprises determining the first portion of the expected energy pattern based upon an expected hopping pattern for the first plurality of time slots.

4. The method of claim 3, wherein the sample period has a duration which is substantially equal to the first time period which falls within the time uncertainty window.

5. The method of claim 1, wherein determining whether the first time period is a coarse synchronization candidate further comprises determining whether the sample energy pattern and the first portion of the expected energy pattern are substantially a match.

6. The method of claim 1, and if the first time period is determined to not be a coarse synchronization candidate, then further comprising:

comparing the sample energy pattern to a next portion of the expected energy pattern, the next portion of the expected energy pattern corresponding to a next time period within the time uncertainty window; and

determining whether the next time period is a coarse synchronization candidate as a function of the comparison between the sample energy pattern and the next portion of the expected energy pattern.

7. The method of claim 6, and further comprising sequentially repeating, for subsequent time periods within the time uncertainty window until a coarse synchronization candidate is found, the step of comparing the sample energy pattern to the next portion of the expected energy pattern, and the step of determining whether the next time period is a coarse synchronization candidate as a function of the comparison.

8. The method of claim 7, and after a coarse synchronization candidate is found, then further comprising:

tuning the first receiver to a second frequency out of the plurality of frequencies used in the data link network;

observing signal strength of signals received on the second frequency during a second sample time period to obtain a second sample energy pattern;

determining a second expected energy pattern during a time period corresponding to the second sample time period, using the coarse synchronization candidate as a reference time, based upon the known hopping pattern;

comparing the second sample energy pattern to the second expected energy pattern corresponding to the second sample time period; and

verifying the accuracy of the coarse synchronization candidate based upon the comparison between the second sample energy pattern and the expected energy pattern.

9. The method of claim 1, and further comprising:
tuning each of a plurality of other receivers to
different ones of a plurality of other
frequencies used in the data link network;
observing signal strength of signals received on each
of the plurality of other frequencies during the
sample time period to obtain a plurality of
other sample energy patterns;
determining a plurality of other expected energy
patterns corresponding to the time uncertainty
window, each of the plurality of other expected
energy patterns being based upon a known hopping
pattern and upon a corresponding one of the
plurality of other frequencies;
comparing each of the plurality of other sample
energy patterns to a first portion of the
corresponding one of the plurality of other
expected energy patterns, the first portion of
each of the plurality of other expected energy
patterns corresponding to a time period within
the time uncertainty window; and
determining whether the time period within the time
uncertainty window is a coarse synchronization
candidate as a function of the comparisons.

10. A radio for use in a frequency hopped/direct sequence spread spectrum (FH/DSS) time division multiple access (TDMA) data link network, the radio comprising:

a first receiver adapted to be tuned to a first frequency out of a plurality of frequencies used in the data link network;

signal strength determining circuitry adapted to observe signal strength of signals received on the first frequency during a sample time period;

processing circuitry coupled to the signal strength determining circuitry and adapted to determine a sample energy pattern in response to the observations by the signal strength determining circuitry, the processing circuitry being further adapted to determine an expected energy pattern corresponding to a time uncertainty window, the expected energy pattern being based upon a known hopping pattern, the processing circuitry being adapted to compare the sample energy pattern to a first portion of the expected energy pattern, the first portion of the expected energy pattern corresponding to a first time period within the time uncertainty window, the processing circuitry further being adapted to determine as function of the comparison whether the first time period is a coarse synchronization candidate.

11. The radio of claim 10, wherein the processing circuitry is further adapted to:

obtain a received energy pattern by observing the signal strength of the signals received on the first frequency during the sample time period;
compare the received energy pattern to a threshold;
and
determine the sample energy pattern by eliminating energy components from the received energy pattern which do not exceed the threshold.

12. The radio of claim 1, wherein the first time period corresponds to a first plurality of time slots used in the data link network and which fall within the time uncertainty window.

13. The radio of claim 12, wherein the sample period has a duration which is substantially equal to the first time period.

14. The radio of claim 10, wherein if the first time period is determined to not be a synchronization candidate, then the processing circuitry is further adapted to compare the sample energy pattern to a next portion of the expected energy pattern, the next portion of the expected energy pattern corresponding to a next time period within the time uncertainty window, and wherein the processing circuitry is adapted to determine whether the next time period is a coarse synchronization candidate as a function of the comparison between the sample energy pattern and the next portion of the expected energy pattern.

15. An apparatus for obtaining coarse synchronization in a frequency hopped/direct sequence spread spectrum (FH/DSS) time division multiple access (TDMA) data link network, the apparatus comprising:

- means for tuning a first receiver to a first frequency out of a plurality of frequencies used in the data link network;
- means for observing signal strength of signals received on the first frequency during a sample time period to obtain a sample energy pattern;
- means for determining an expected energy pattern corresponding to a time uncertainty window, the expected energy pattern being based upon a known hopping pattern;
- means for comparing the sample energy pattern to a first portion of the expected energy pattern, the first portion of the expected energy pattern corresponding to a first time period within the time uncertainty window; and
- means for determining whether the first time period is a coarse synchronization candidate as a function of the comparison between the sample energy pattern and the first portion of the ~~expected energy pattern.~~